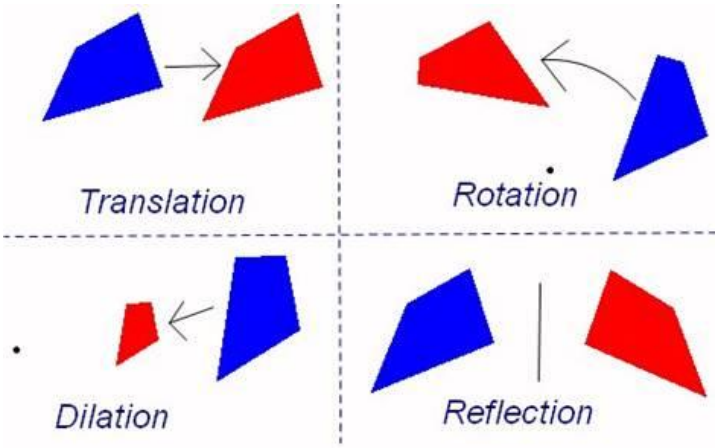
Transformations
Unit 6



Standards:

8.G.1 Verify experimentally the properties of rotations, reflections, and translations:

a Lines are taken to lines, and line segments to line segments of the same length.

b Angles are taken to angles of the same measure.

c Parallel lines are taken to parallel lines.

8.G.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

8.G.3 Describe the effect of dilations, translations, rotations, and reflections on two dimensional figures using coordinates.

8.G.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

8.G.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.

Name: _____ **Date:** _____**Period:** _____

Transformations: The act of changing an object.

When one shape can become another using only turns, flips and/or slides, then the two shapes are _____

Two shapes are _____ when we resize one shape to become Another

When an object is transformed the new object is the image of it and is labeled with prime.

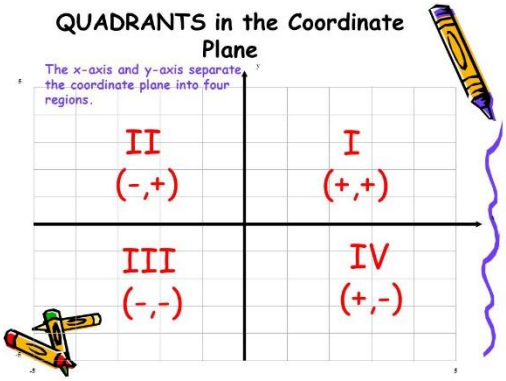
Example point A => A'

If it is transformed again it is double prime

Example point A => A' => A"

Coordinate plane and Quadrants

Quadrant I (+, +)
Quadrant II (-, +)
Quadrant III (-, -)
Quadrant IV (+, -)



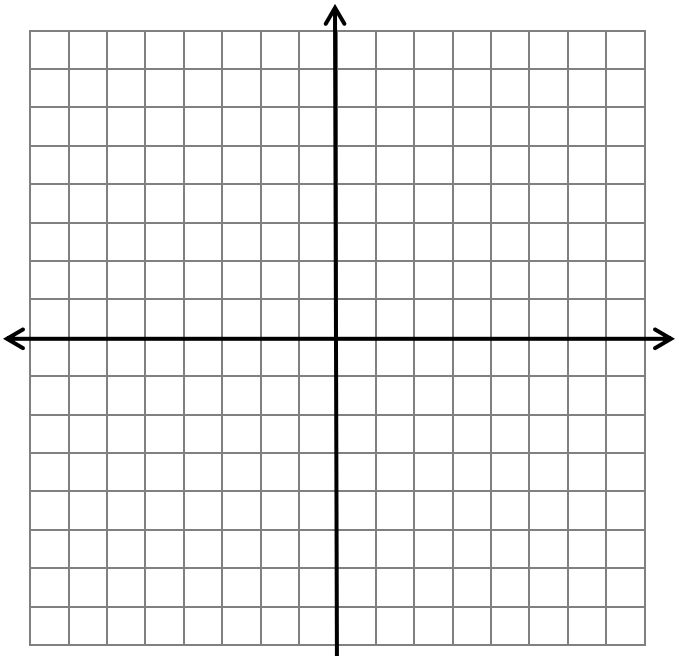
Lesson #66 Translations

A _____ (sometimes called a slide) is the movement of a figure from one position to another without turning it.

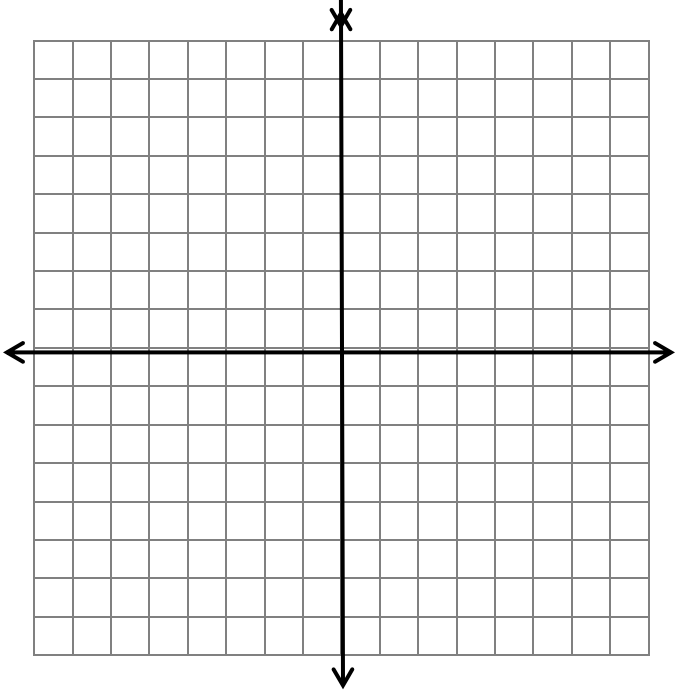
In a translation, every point on the original figure is moved the same _____ and same _____. The image is _____to the original figure.

A translation rule is written (x + a, y + b) With a and b showing the _____ and _____ shift.

1. Graph M(0, 0) A(-6, 0) T(-7, 6) and H (-8, 6). Slide MATH to the right 5 units and down 1 unit (x + 9, y – 2)

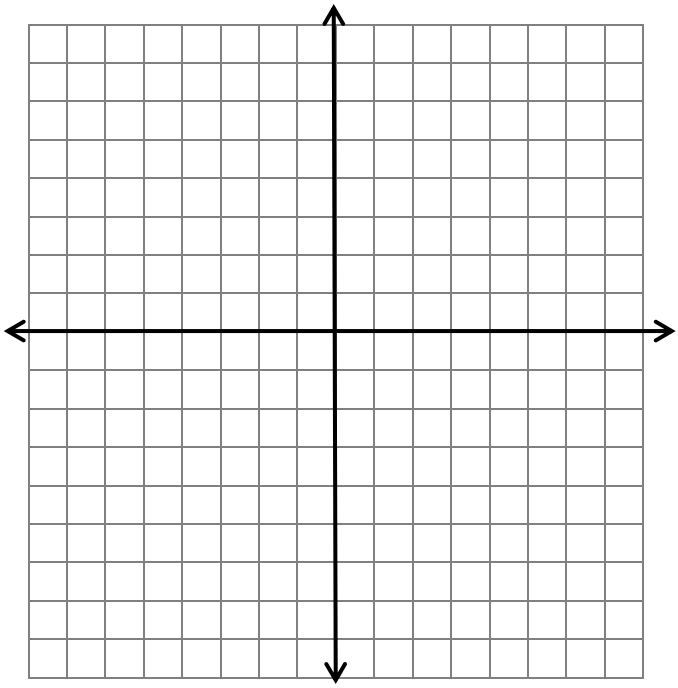


2. Graph R(0, -4) U(4, -2) L(6, -4) and E(4, -6). Slide RULE to the right 6 and up 4 (x – 6, y + 8)

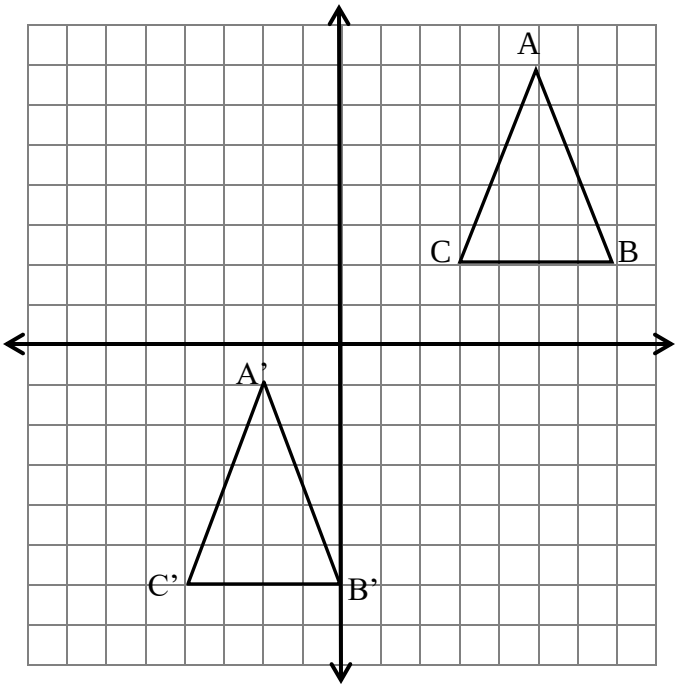


Define Vector:

3. Graph P(-3, 4) E(1, 3) and N (-4, 1). Slide PEN 2 units to the right and 5 down (x + 2, y – 5)



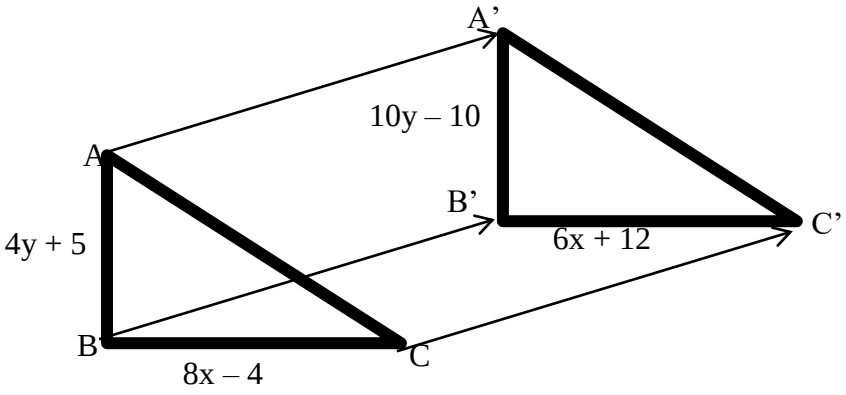
4. Explain the traslation that moved Δ ABC to Δ A'B'C'.



What is the Translation rule? _____

5. What will the coordinates of A(0, -2) B(3, 4) C(5, -1) be after a translation with the rule (x – 6, y + 2) is performed?

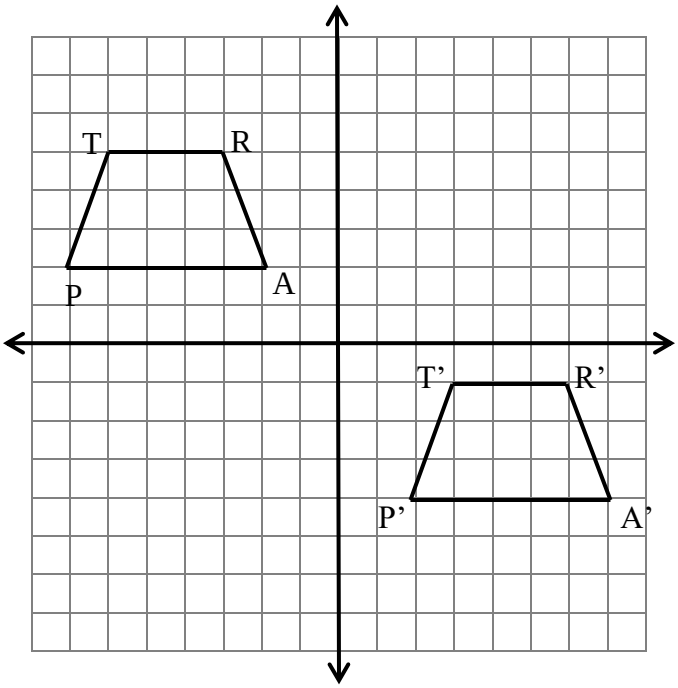
6. Triangle ABC was translated to triangle A'B'C' along the vector shown below. Find x and y and the area of both triangles.



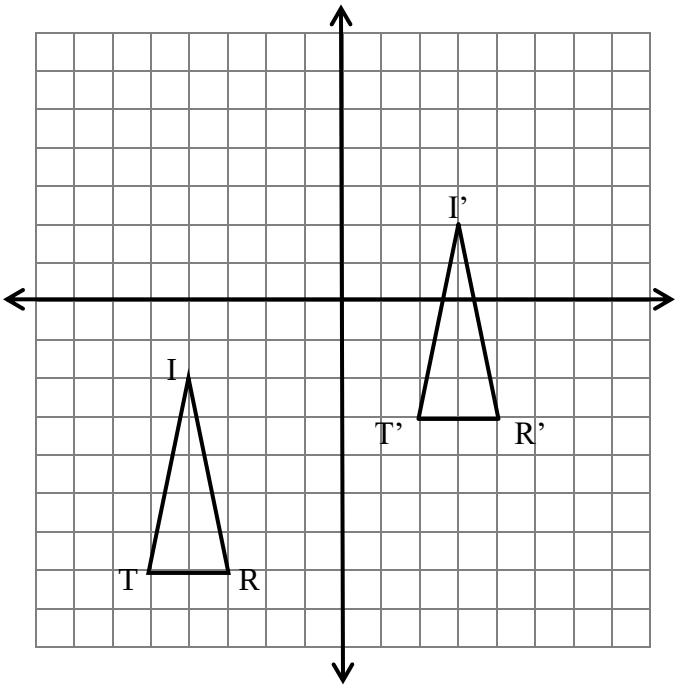
HW #66 Translations

Describe the translation that occurred in each question below:

1. TRAP to T'R'A'P'

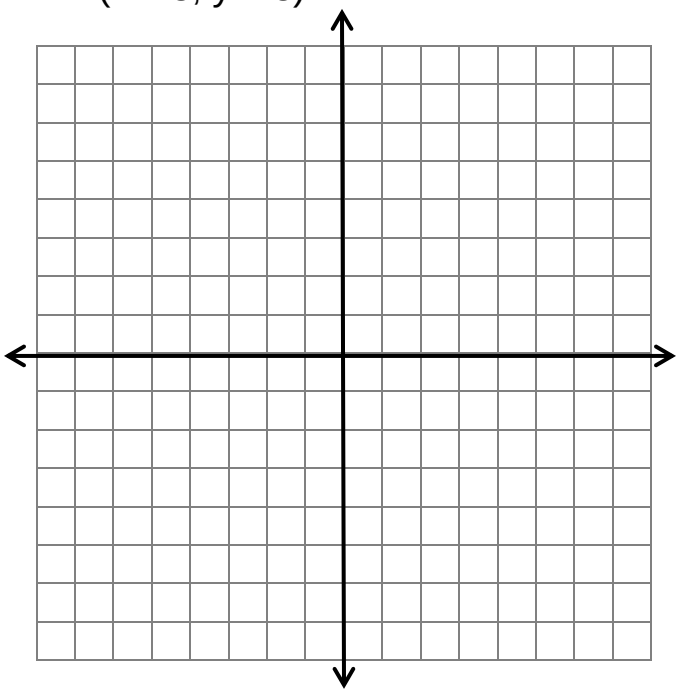


2. TRI to T'R'I'

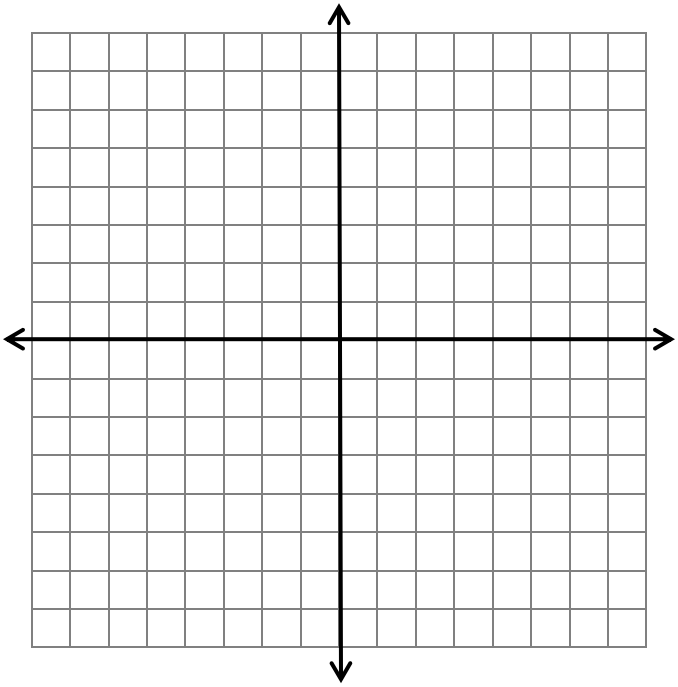


Complete the following translations.

3. Translate M(5, 1) A(3, 4) T(5, 6) H(7, 4) In the direction of (x – 8, y – 8)



4. Translate G(4, -6) E(3, - 2) O(0, -6) in the direction of (x – 5, y + 4)



Lesson #67: Reflections

The mirror image produced by flipping a figure over a line is called a _____.

The line is called the _____.

To reflect a shape over the _____, change the sign of the _____.

To reflect a shape over the _____, change the sign of the _____.

Try the following:

1. Triangle ABC, with vertices A(4, -5), B(1, -2) and C(5, -1), is reflected over the y axis. Where are the vertices of the new triangle located?

   A → _____ B → _____ C → _____

2. Quadrilateral DEFG, with vertices D(-2, -5), E(-4, -5), F(-6, -1) and G(-3, -1), is reflected over the x axis. Where are the vertices of the new triangle located?

   D → _____ E → _____ F → _____ G → _____

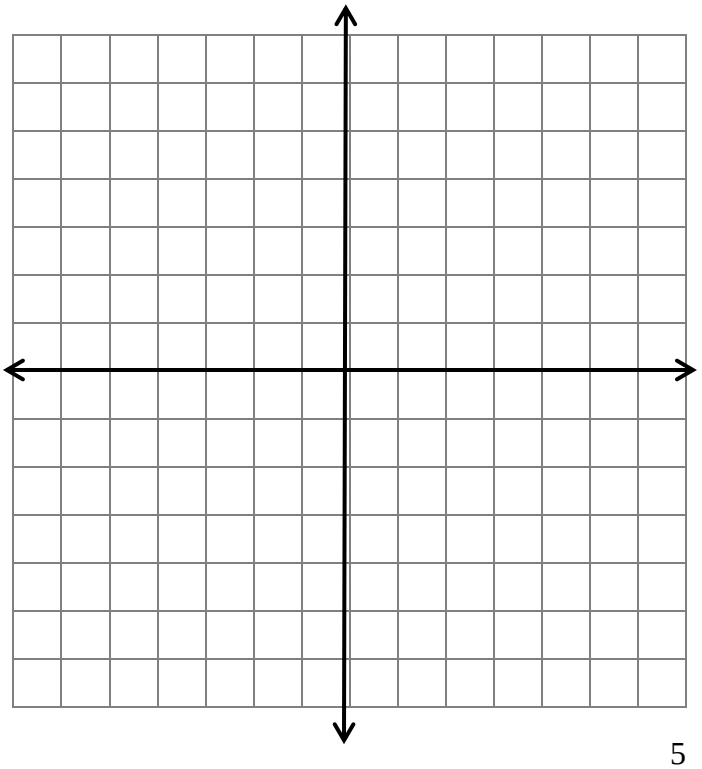
3. Graph T(-6, 1) R(-5, 5) A(-2, 5) P(-1,1)

   Reflect TRAP over the x axis.

   Where is P' located? _____

   Reflect T'R'A'P' over the y axis.

   Where is P" located? _____



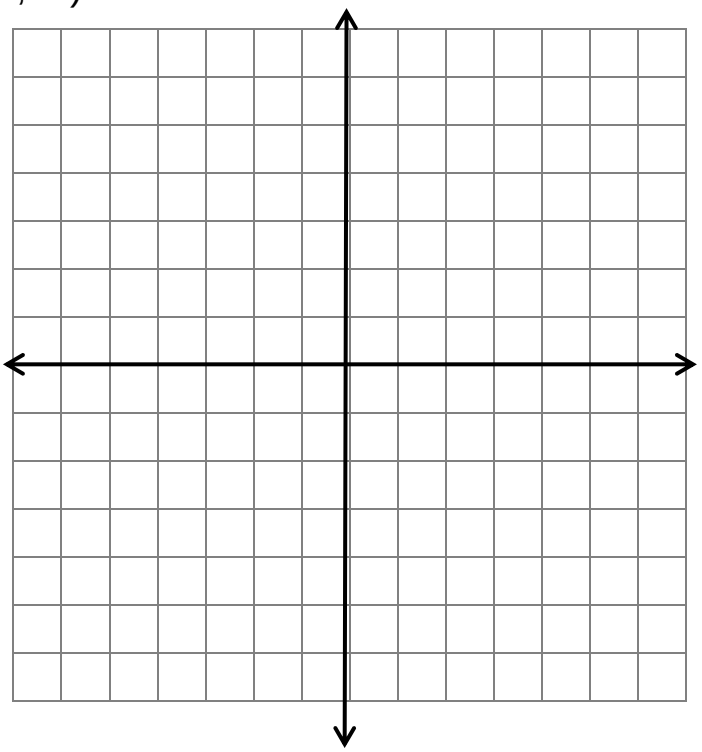
4. Graph C(4, -2) A(6, -4) N(5, -6) D(3, -6) Y(2, -4)

Reflect CANDY over the y axis.

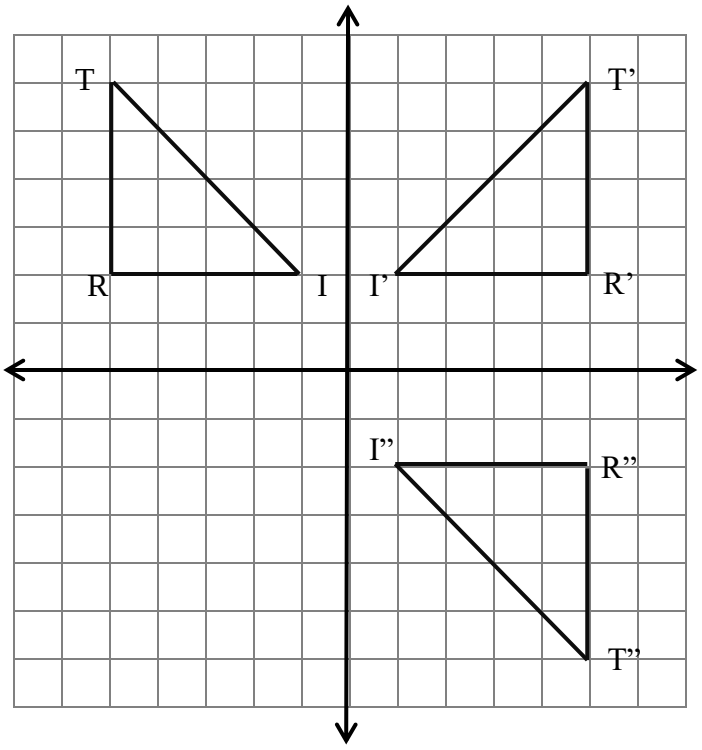
Where is A' located? _____

Reflect C'A'N'D'Y' over the x axis.

Where is A" located? _____



5. Explain the sequence of transformations below that bring ΔTRI to Δ T"R"I"



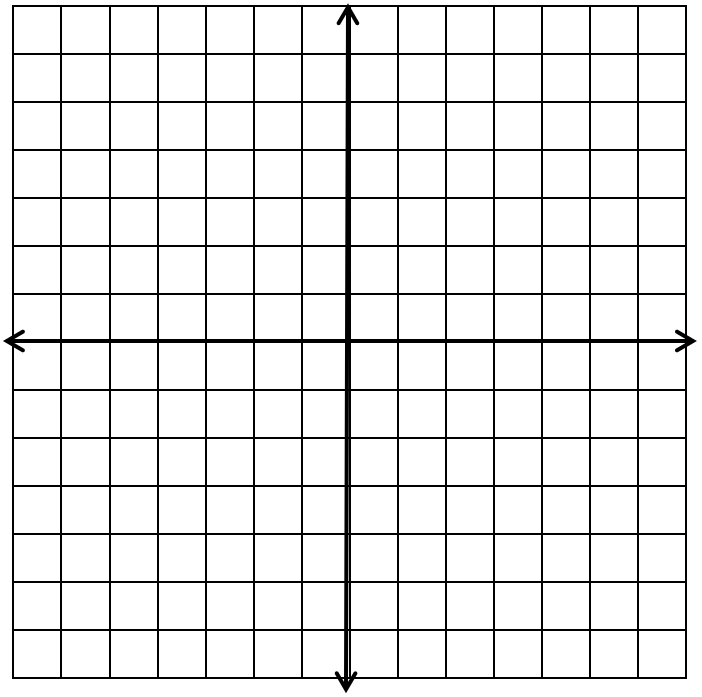
6. The area of a rectangle is given as ten less than three halves of a number. The rectangle is reflected over a line. The new rectangle's area is given as five more than three quarters of the same number. Find the number and the area of each rectangle.

HW #67 *Reflections*

1. Plot and label the points

   R (2, 6) U (2, 2) L (5, 1) E (5, 6)

2. Reflect the shape across the y – axis.



3. Plot and label the points

   A (-4, -1) P (-2, -3) L (-3, -5)
   U (-5, -5) S (-6, -3)

4. Reflect the shape across the y – axis.

5. Plot and label the points

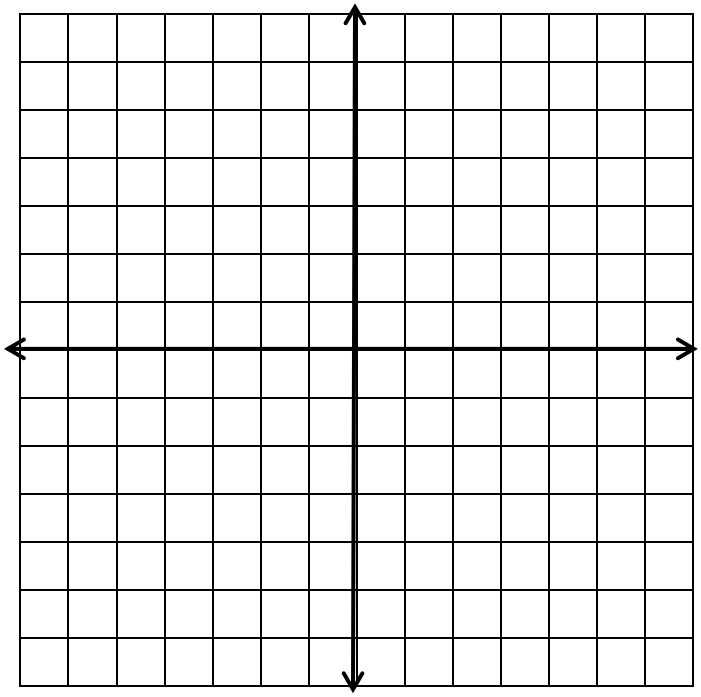
   G (1, 1) E (5, 2) O (3, 5)

6. Reflect the shape across the x – axis

7. Plot and label the points

   T (-3, -1) R (-1, -4) I (-3, -6) G (-5, -4)

8. Reflect the shape across the x – axis.



Lesson #68 180° Rotations

A **rotation** is a transformation involving the _____ of a figure around a fixed point called the **center of rotation or the origin.**

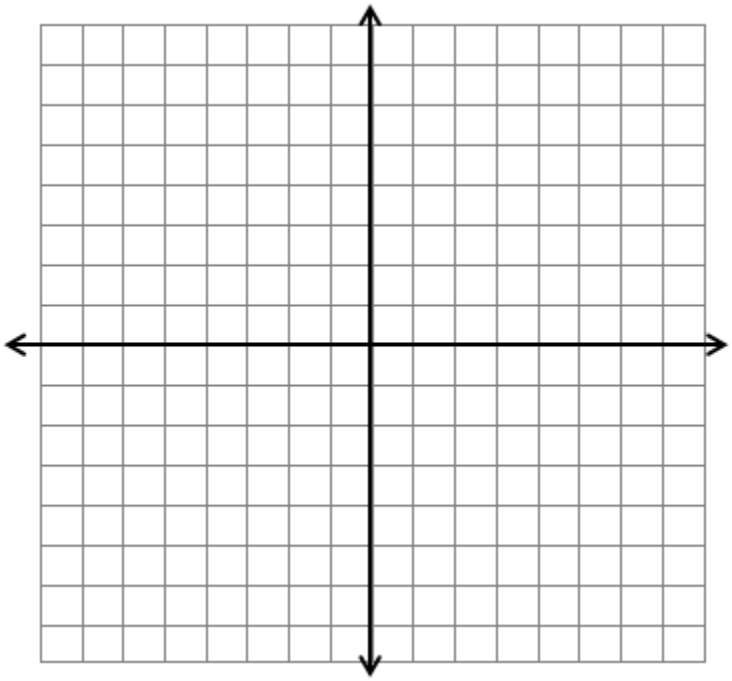
Center of rotation can also be called the _____**.**

To rotate a figure _____ - _____ of the original coordinates.

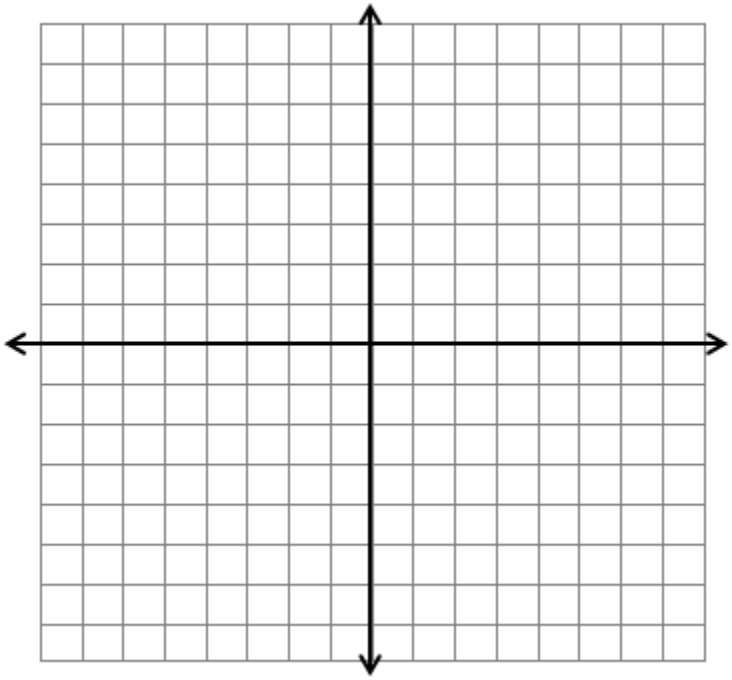
Try the following:

1. Graph S(-3, 1) I(-6, 1) G(-6, 4) and N(-3, 4).

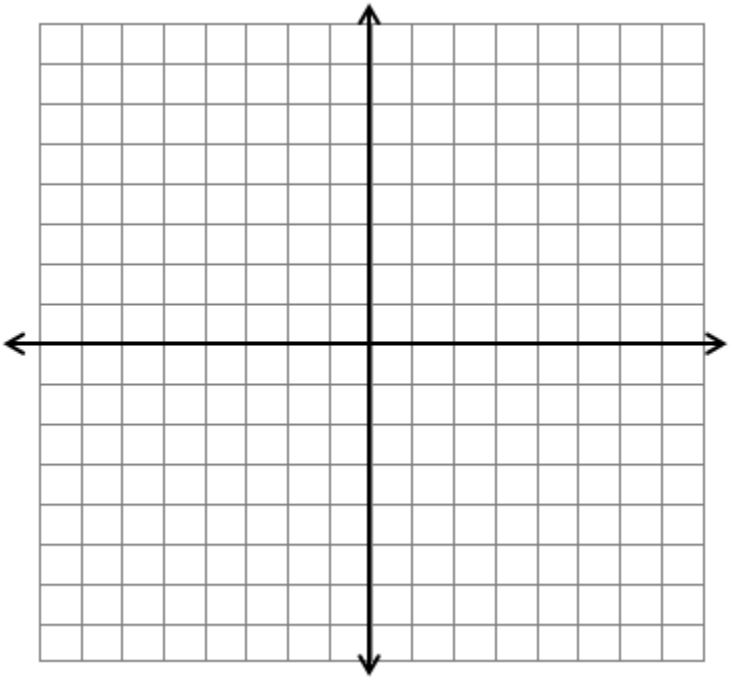
   Rotate SIGN 180˚



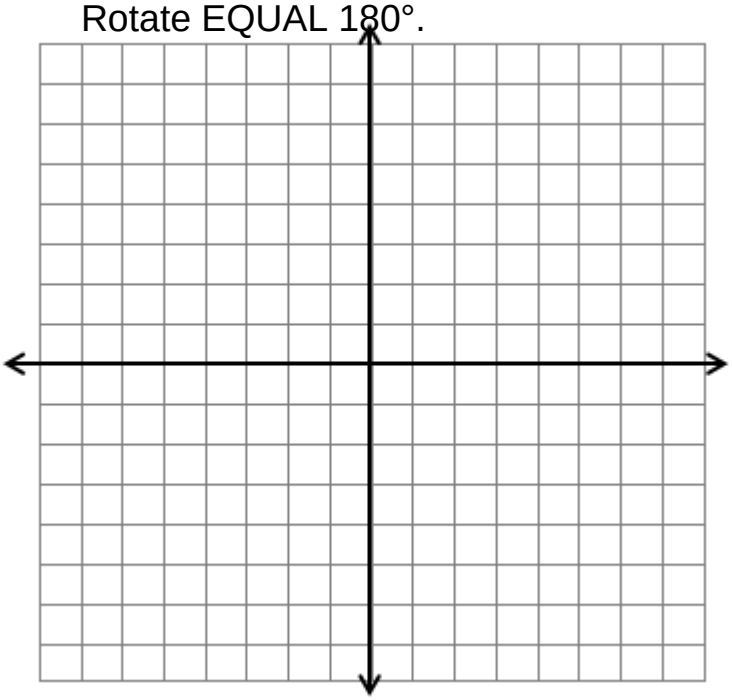
2. Graph O(-3, 4) N(2, 7) and E(4, 2). Rotate ONE 180˚ .



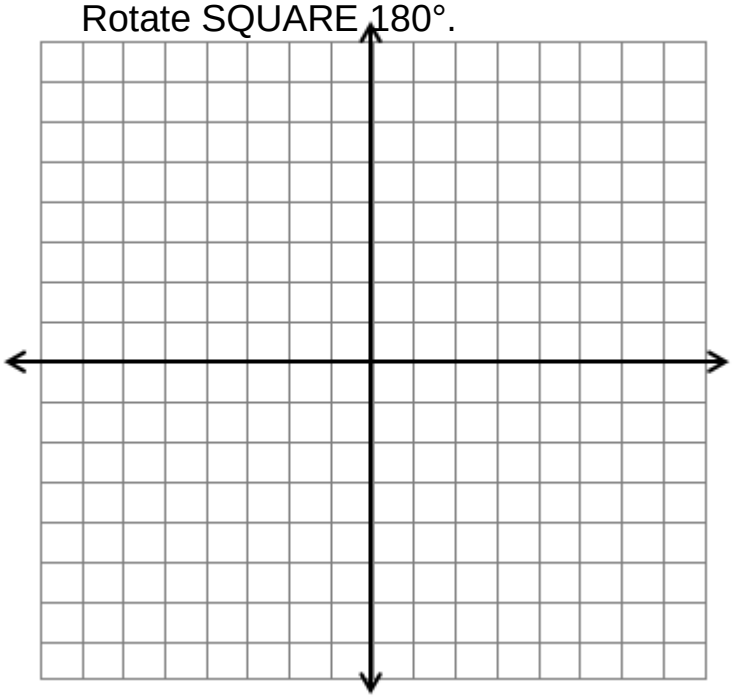
3. Graph F(-5, 2) O(-7, -4) U(-4, -7) and R(2, -5).
   Rotate FOUR 180˚ Clockwise.



4. Graph E(-5, -2) Q(-6, 3) U(-4, 5) A(-2, 3) and L(-3, -2). Rotate EQUAL 180°.

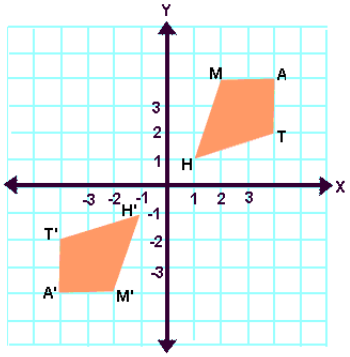


5. Graph S(3, 8) Q(5, 8) U(5, 4) A(8, 4) R(8, 2) E(3, 2). Rotate SQUARE 180°.

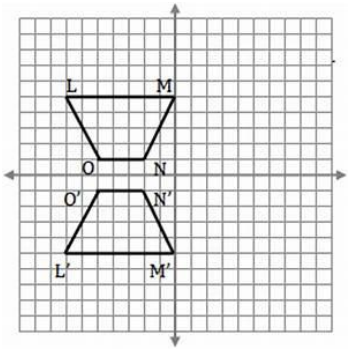


6. The length of a rectangle is labeled as twelve less than three times its width. The rectangle is rotated 180°. The new rectangle's length is labeled as five less than five halves its width. Find the dimensions of each rectangle using what you know about rotations.

7. Is this a rotation of 180°? _____
Why or why not: _____
If it is label the center of rotation



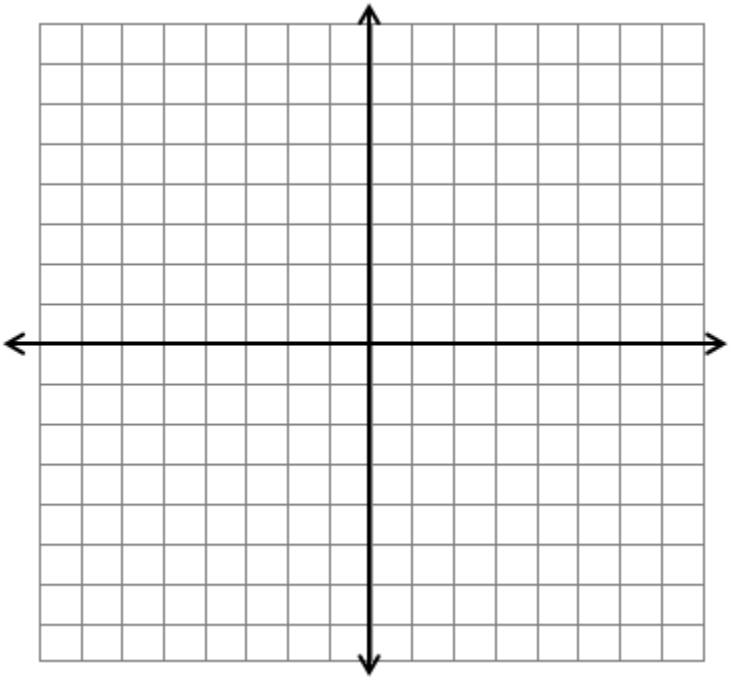
8. Is this a rotation of 180°? _____
Why or why not: _____
If it is label the center of rotation



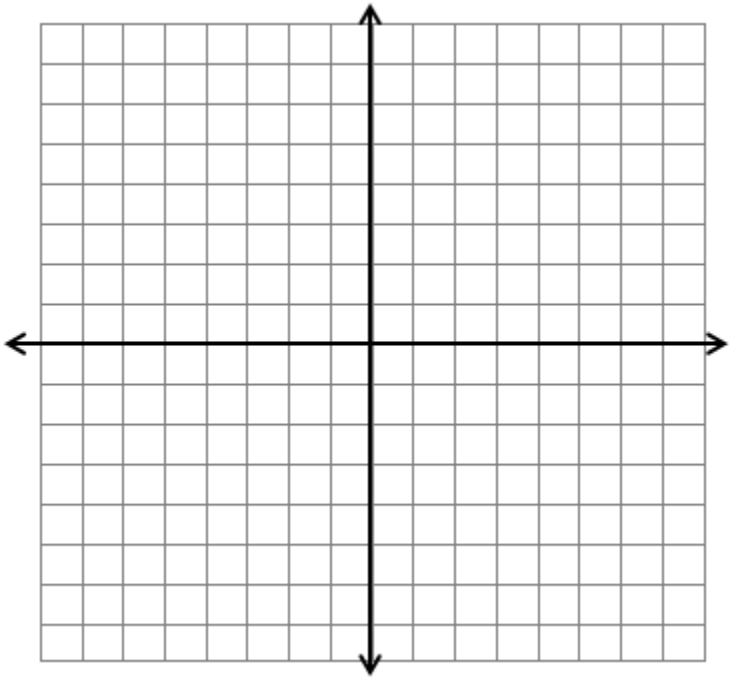
HW #68 *180°Rotations*

1. Graph M(1, 1) A(2, 4) T(5, 4) H(6, 1).

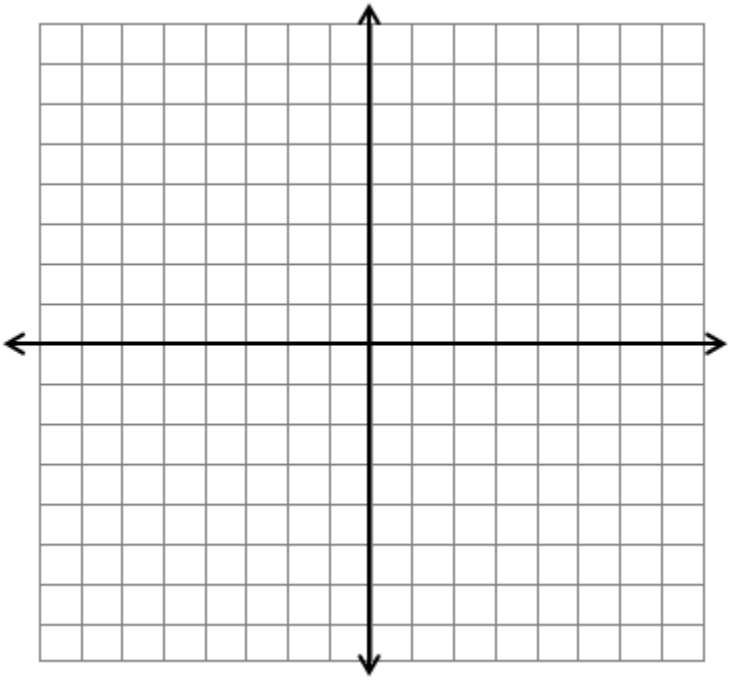
   Rotate the MATH 180°.



2. Graph S (-4, -1) T(-1 -4) A(-4, -7) R(-7, -4).
   Rotate the STAR 180°.

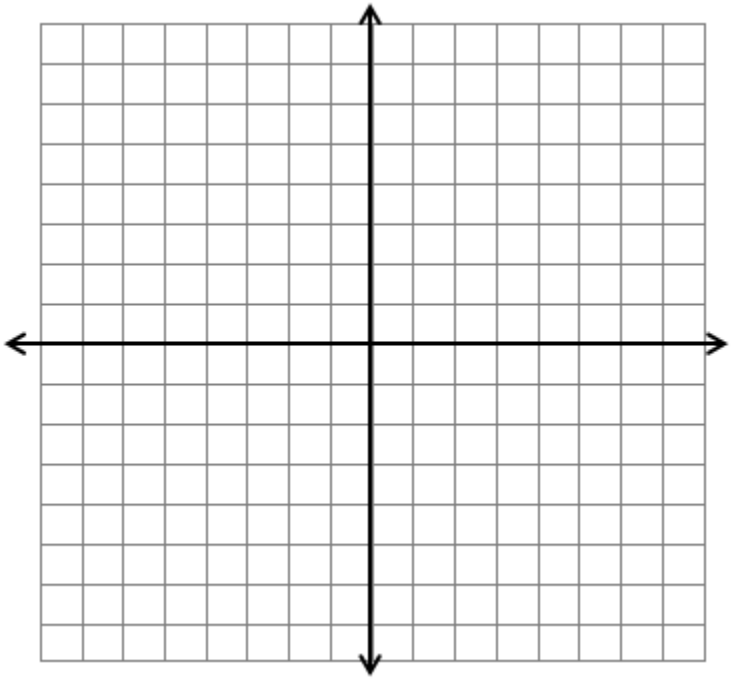


3. Graph H(2 ,-2) O(2, 5) U(5, 7) S(8, 5) E(8, -2).
   Rotate HOUSE 180°.



4. Graph Q(-2, 4) U(2, 6) A(6, 2) D(4,-2)

   Rotate QUAD 180°.



Lesson #69 90° Rotations

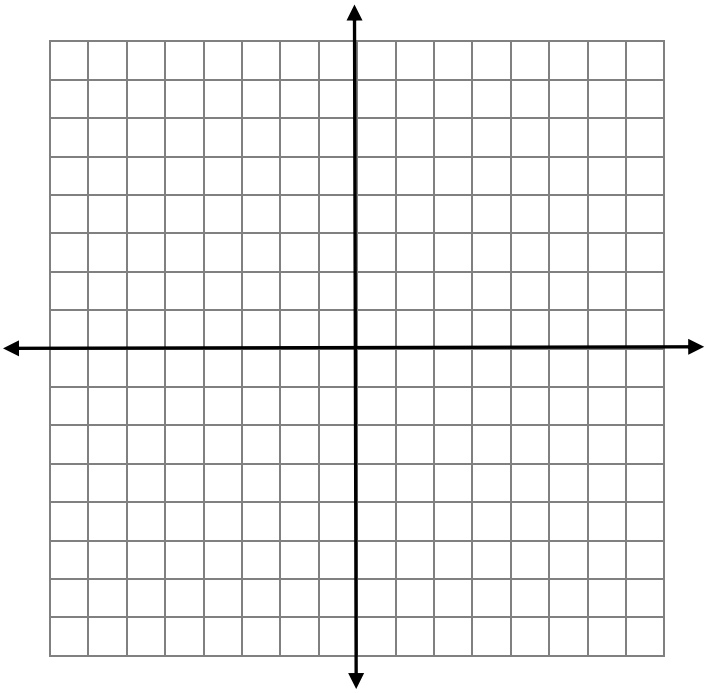
To rotate a figure ____ - switch the x and y for each coordinate and apply the signs of the quadrant it will turn into.

Try the following:

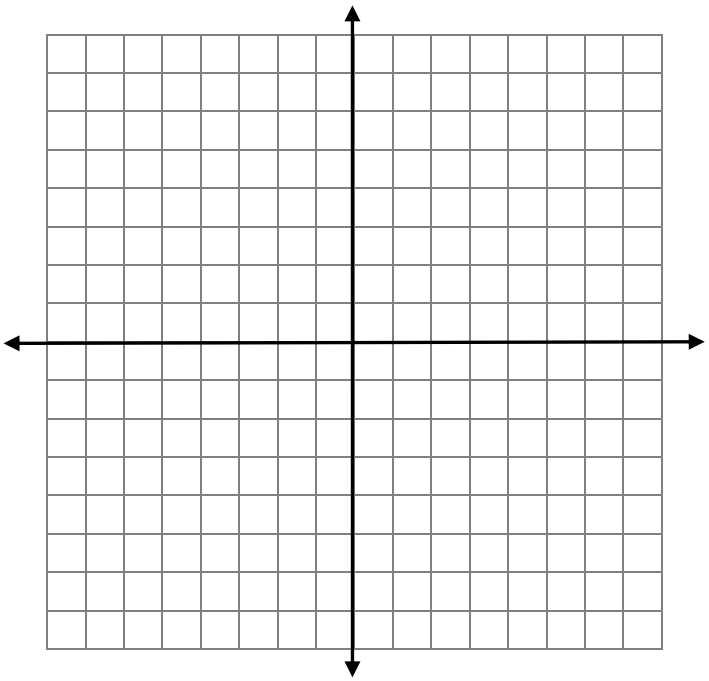
1. Graph S(1,1) C(7, 1) and I(4, 6)

   Rotate 90˚ Clockwise.

   What is the new coordinate for C'?

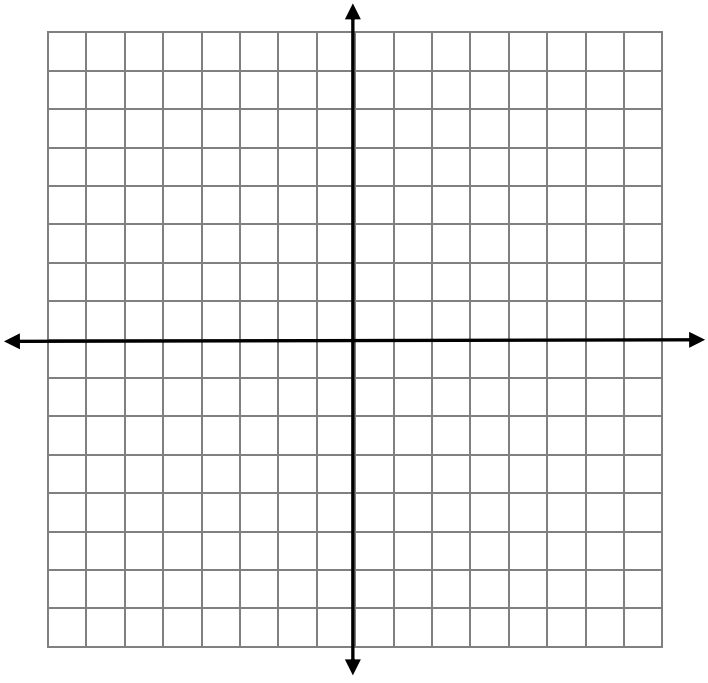


2. Graph M(-3, -2) A(-1, -4) R(-3, -8) and K(-5, -4).
   Rotate 90˚ Counter Clockwise.



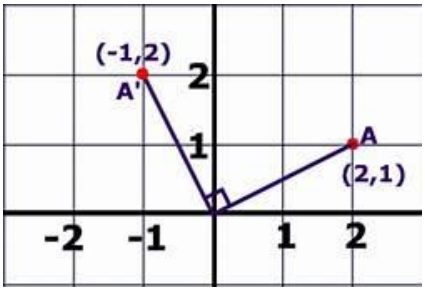
3. Graph A(1, 2) R(5, 2) and T(3, 8).

   Rotate 90˚ Clockwise.

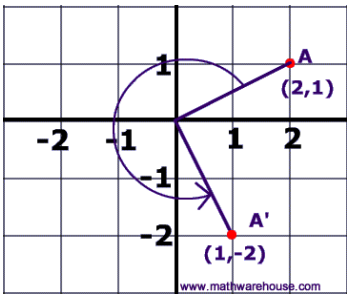


4. Look at the 2 graphs Graph A is a rotation 90° counterclockwise and Graph B is a rotation 270° counterclockwise what is the difference between them?

A)



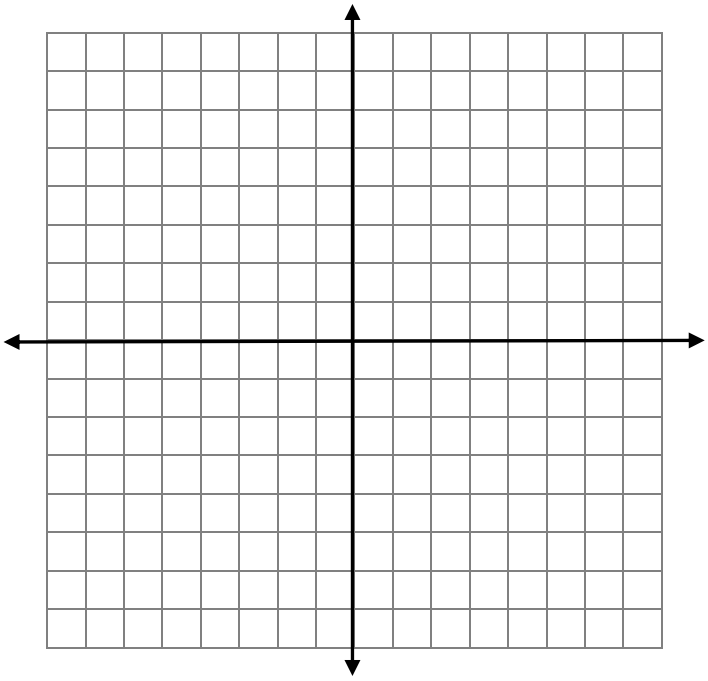
B)

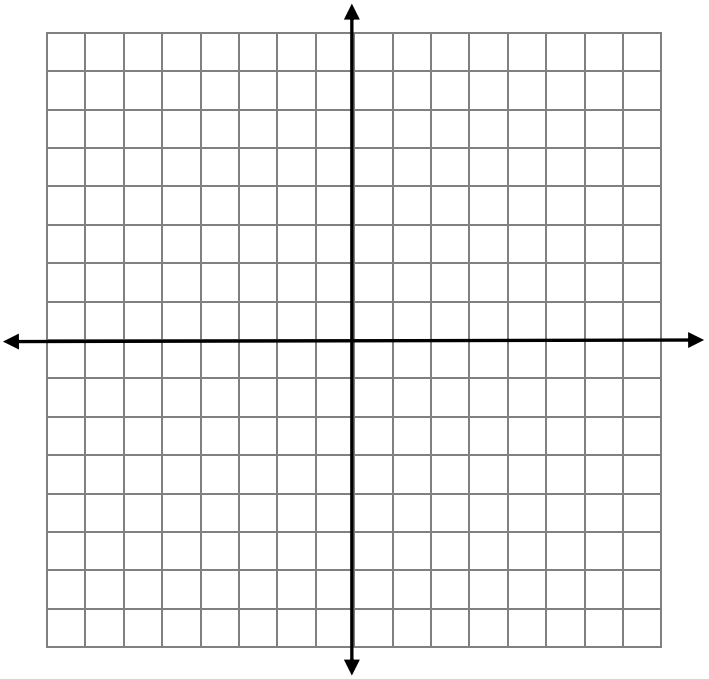


What is the same? What can you say about the image of a 90° and a 270° rotation?

5. Graph S(-6, 2) U(-3, 7) N(0, 2)
Rotate 270° Clockwise.

6. Graph S(2, 2) N(5, 5) O(8, 2) W(5, -2)
Rotate 270° Counter Clockwise.

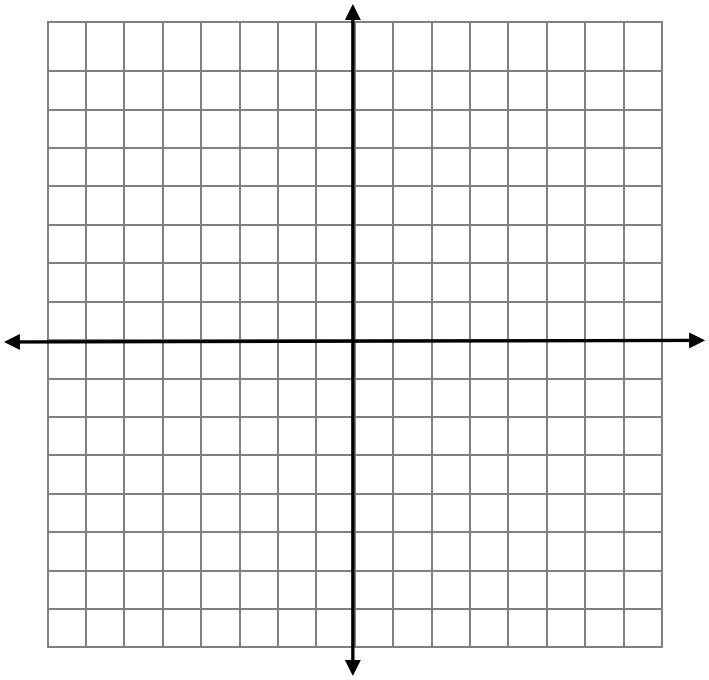




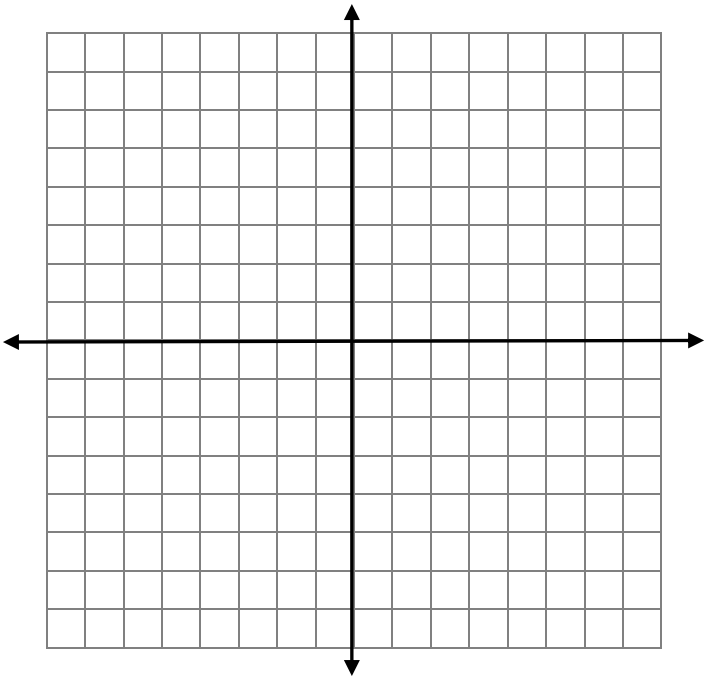
7. The area of a triangle is given as eighteen less than seven quarters of a number. The triangle is rotated 90°counter clockwise. The area of the new triangle is given as fourteen more than three quarters of a number. Find the number and the area of each triangle.

HW #69 *90° Rotations*

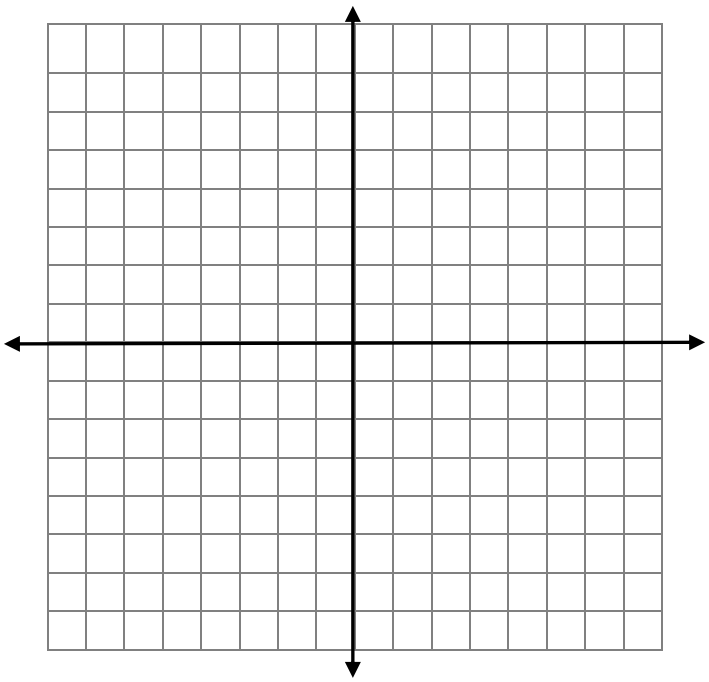
1. Graph M(1, 1) A(2, 4) T(5, 4) H(6, 1) Rotate 90° Clockwise. Clockwise.



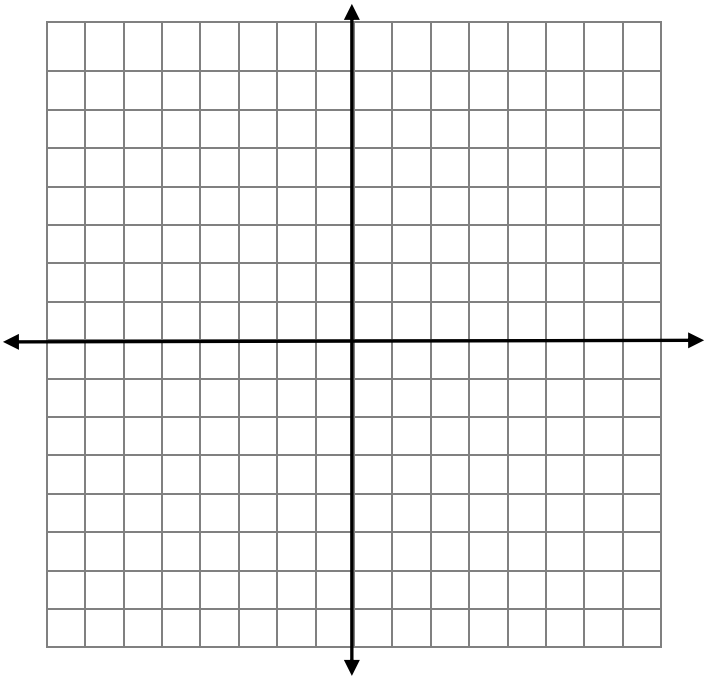
2. Graph S (-4, -1) T(-1 -4) A (-4, -7) R(-7, -4) Rotate 90° Counter



3. Graph S(-7, 0) M(-4, 6) H(-1, 0) Rotate 270°Counter Clockwise.



4. Graph T(0, -2) R(3, -8) I(-3, -8) Rotate 270°Clockwise.



Lesson #70: Properties of Dilations

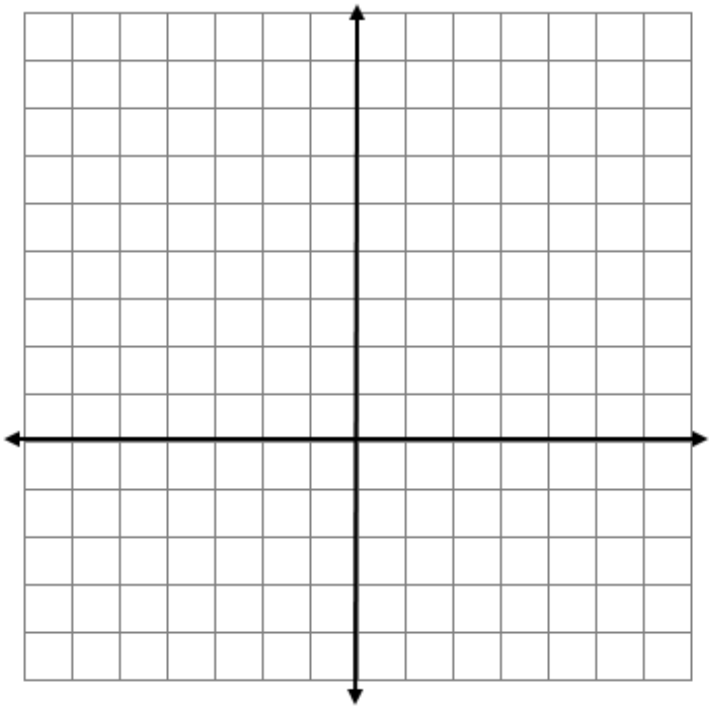
The image produced by _____ a figure is called a **dilation.**

To complete a dilation on a coordinate plane, simply multiply each _____ by the given scale factor. You should notice that the shape will either move closer to or further away from the origin as it acts as the _____ in this case.

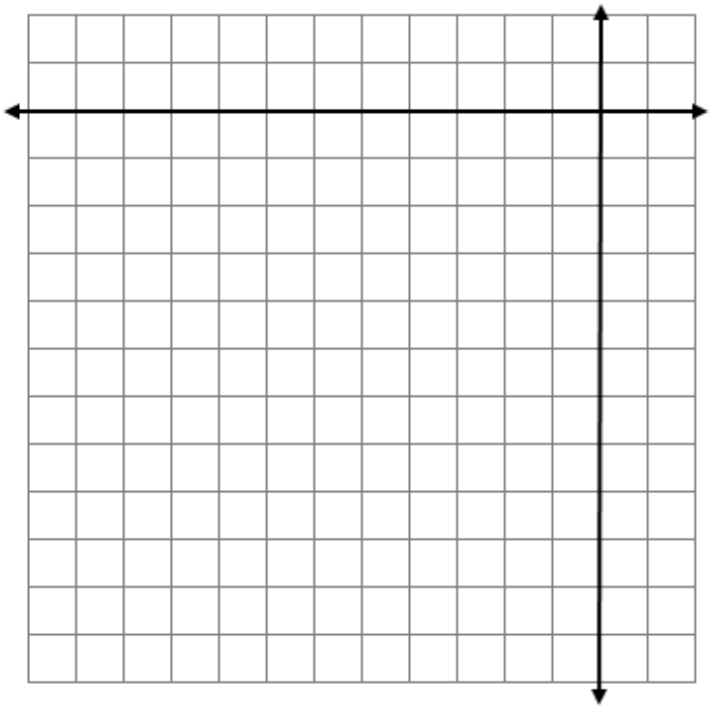
A scale factor less than one will produce a _____ figure that is closer to the _____. It makes the image _____

A scale factor greater than one will produce a _____ figure that is further from the _____. It makes the image _____

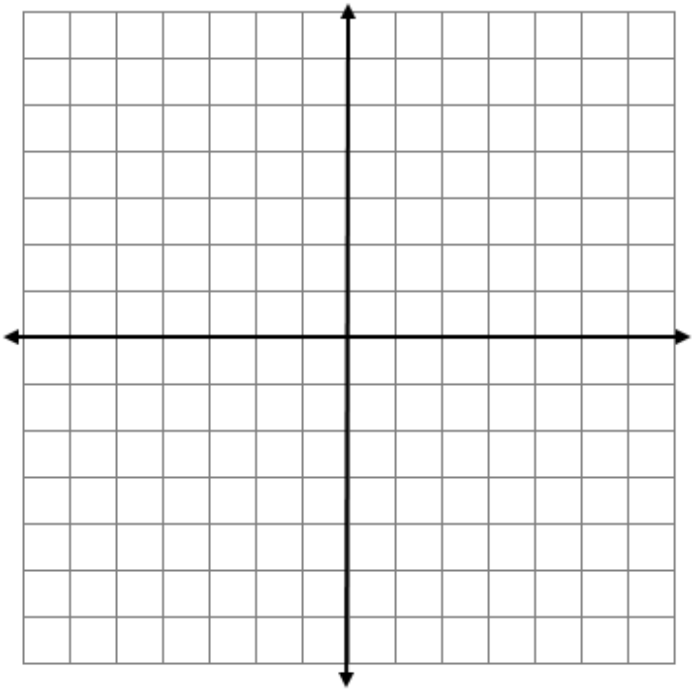
1. Graph P(0, 8) E(-4, -4) and N(4, -4). Graph the image of P'E'N' after a dilation with a after a scale factor of $\frac{1}{4}$.



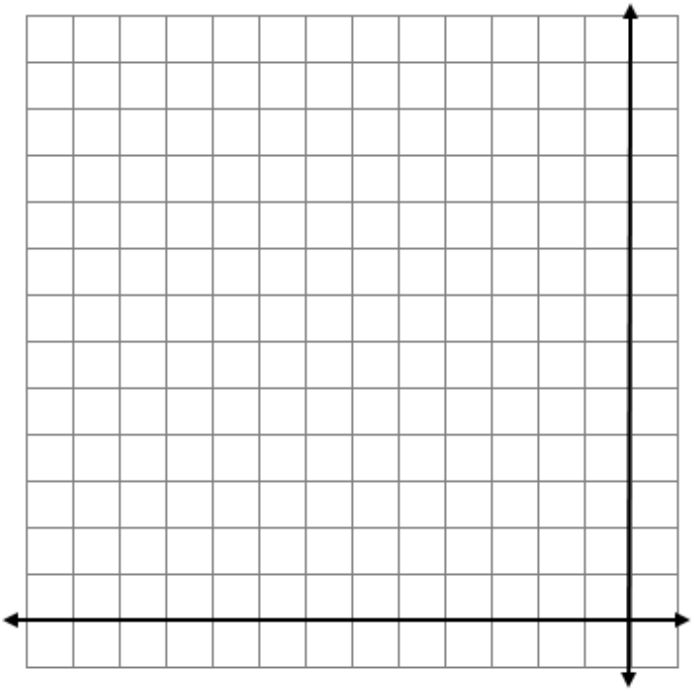
2. Graph Q(-4, -2) U(-4, -4) A(-2, -2) and D(-2, -4). Graph the image of Q'U'A'D' after a dilation with a scale factor of 3.



3. Graph M(-6, 6), A (6, 6), T(6, -6) and H(-6, -6). Graph the image of M'A'T'H' after a dilation with a scale factor of $\frac{2}{3}$.



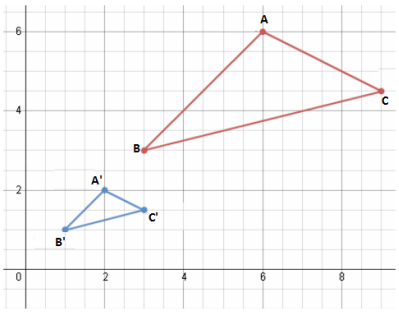
4. Graph F(0,0), U(-4, 6), and N(-8, 2). Graph the image of F'U'N' after a dilation with a scale factor of 1.5.

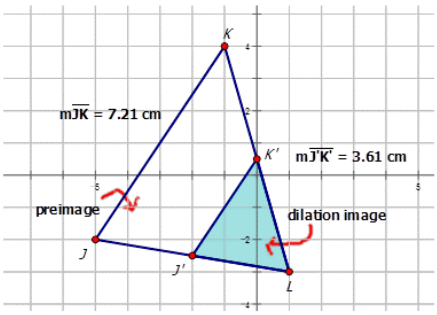


5. Rectangle QUAD's length is three less than twice its width. Rectangle Q'U'A'D' is the image of QUAD dilated by two thirds. Rectangle Q'U'A'D''s perimeter is 32. Find the dimensions of both rectangles.

6. What would happen if the center of dilation was not the origin?

7. Circle the center of dilation on the following graphs.

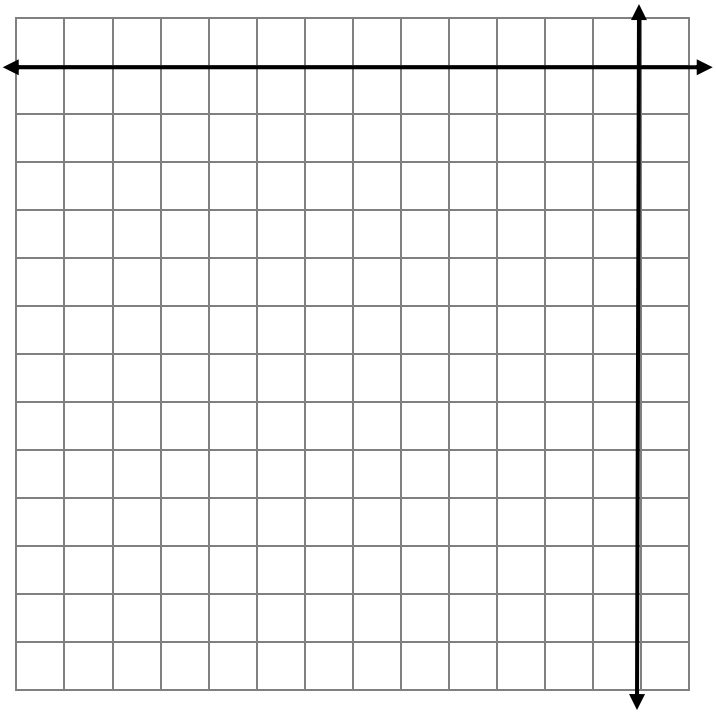




HW #70 *Dilations*

1. Plot and label the points
   M(-2, -2) A(-2, -6) T(-4, -6) H(-4, -2)

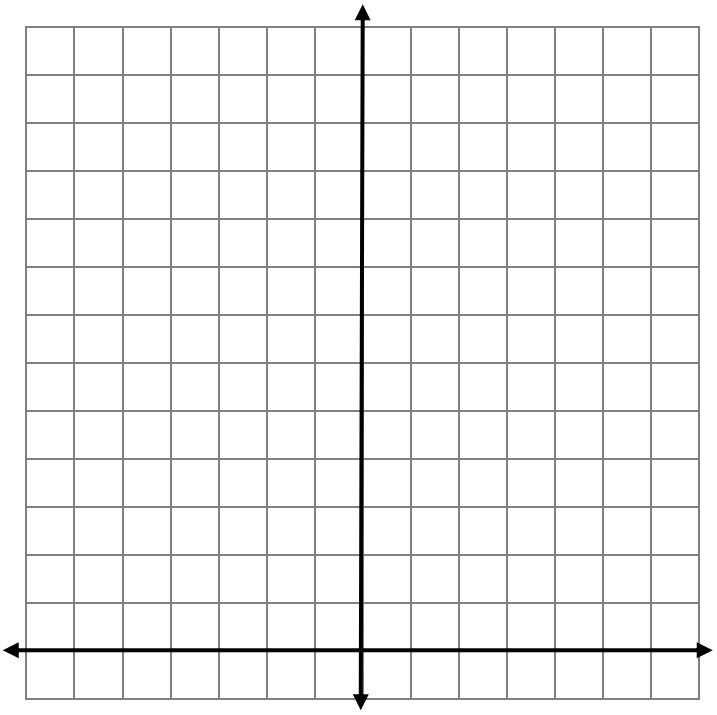
   Dilate MATH by a scale factor of 1.5.



2. Plot and label the points

   F(-6, 0) U(0, 12) N(6, 0)

   Dilate FUN by a scale factor of $\frac{1}{3}$.



Lesson #71: Scale Factor

To determine the scale factor of a shape:

1. Record one of the corresponding pairs of _____.
2. Create a _____ with the x values in the coordinate, such that the prime coordinate is in the _____ and the original coordinate is in the _____.
3. _____ the ratio.

Examples:

1. L (-12, 8) → L'(-36, 24)

SF= _____

2. E (16, -4) → E'(4, -1)

SF= _____

3. T(9, -15) → T'(6, -10)

SF= _____

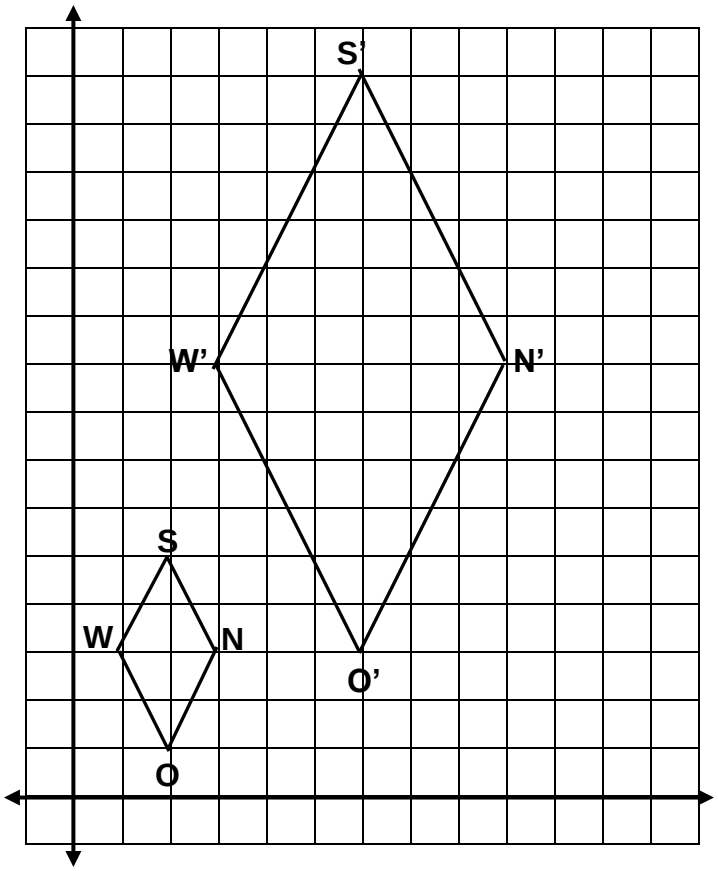
4. I(-14, 8) → I'(-21, 12)

SF= _____

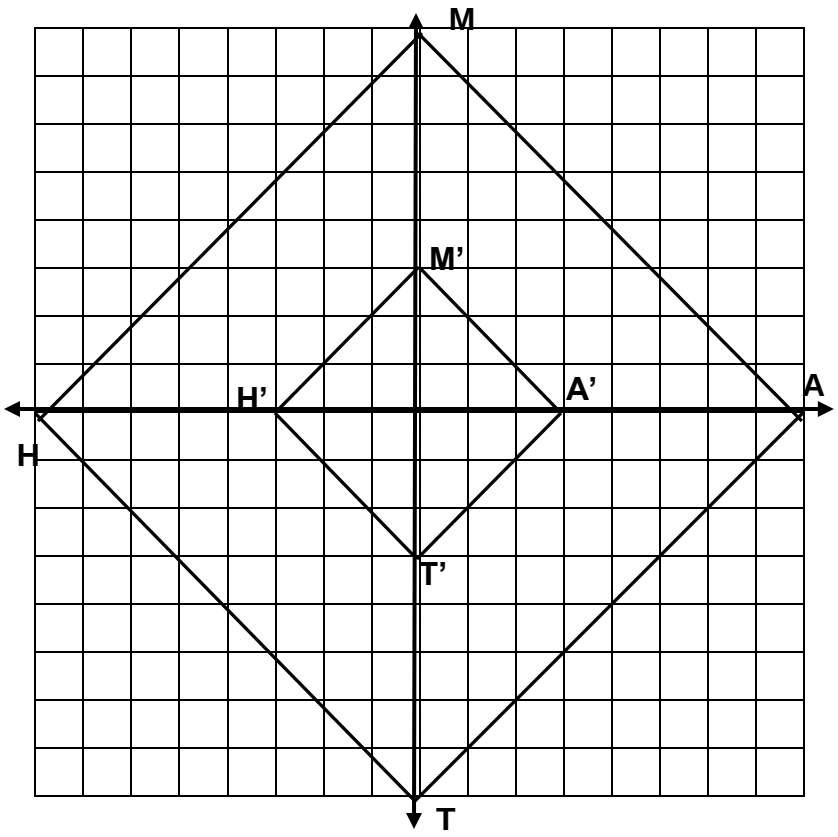
5. T(-20, -8) → T'(-15, -6)

SF= _____

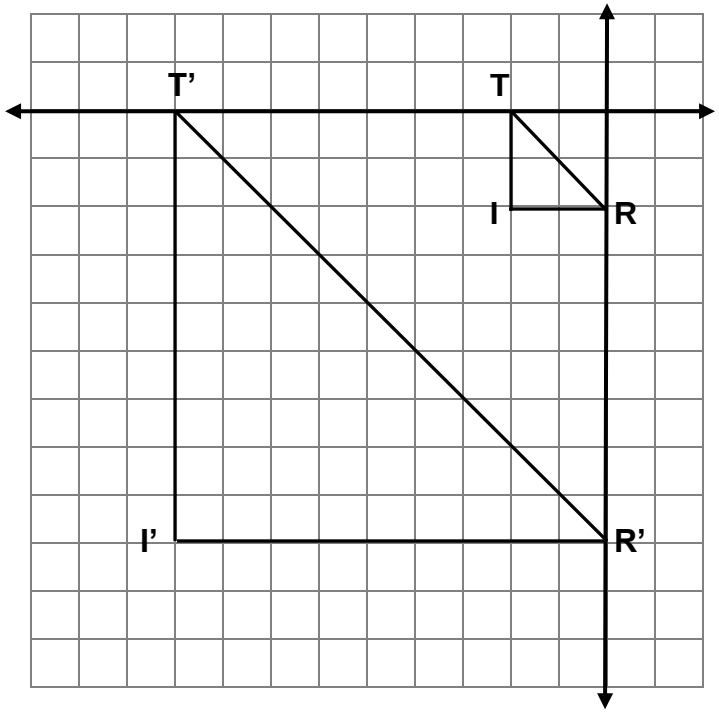
6. Find the scale factor used to dilate SNOW in the diagram at right.



7. Find the scale factor to dilate MATH.

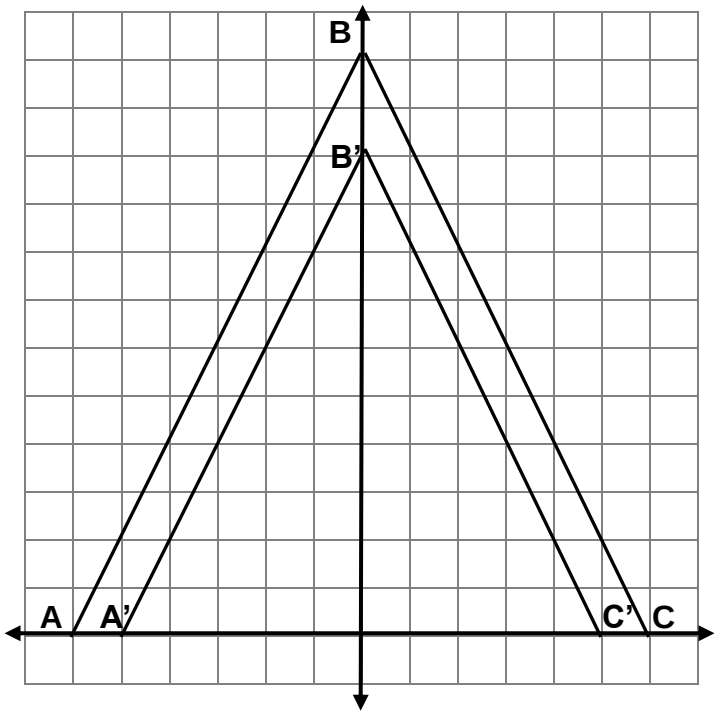


8. Find the scale factor to dilate TRI.



SF= _____

9. Find the scale factor of ABC.



SF= _____

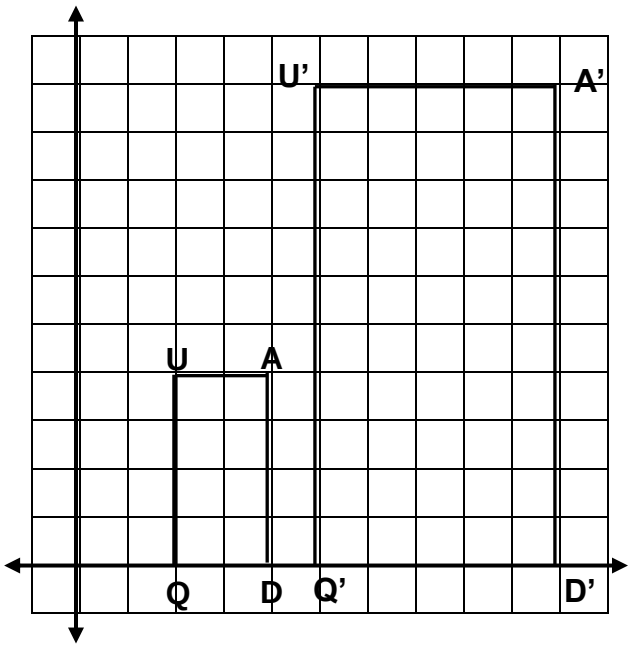
HW #71 Scale Factor

Find the scale factor for each set of coordinates below.

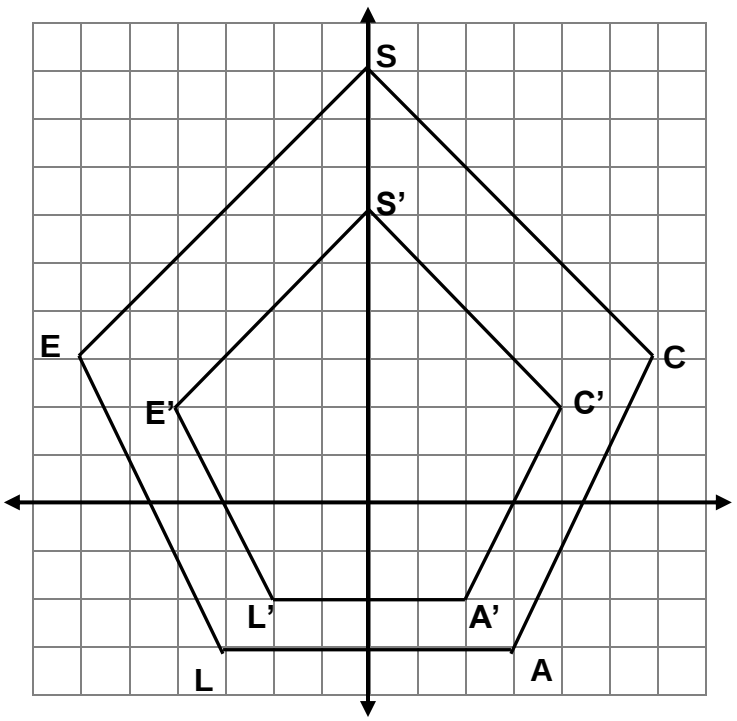
1. G(15, 20) → G'(9, 12) 2. E(8, 14) → E'(28, 49) 3. O(16, 20) → O'(12, 15)

SF= _____ SF= _____ SF= _____

4. Find the scale factor to dilate QUAD.



5. Find the scale factor to dilate SCALE.



Lesson #72 Sequencing Transformations

A sequence of transformations proves whether shapes are _____

_____.

A _____ lists the sequence of

transformations that bring one shape to another, proving that they are congruent.

A _____ lists the sequence of

transformations that bring one shape to another, proving that they are similar.

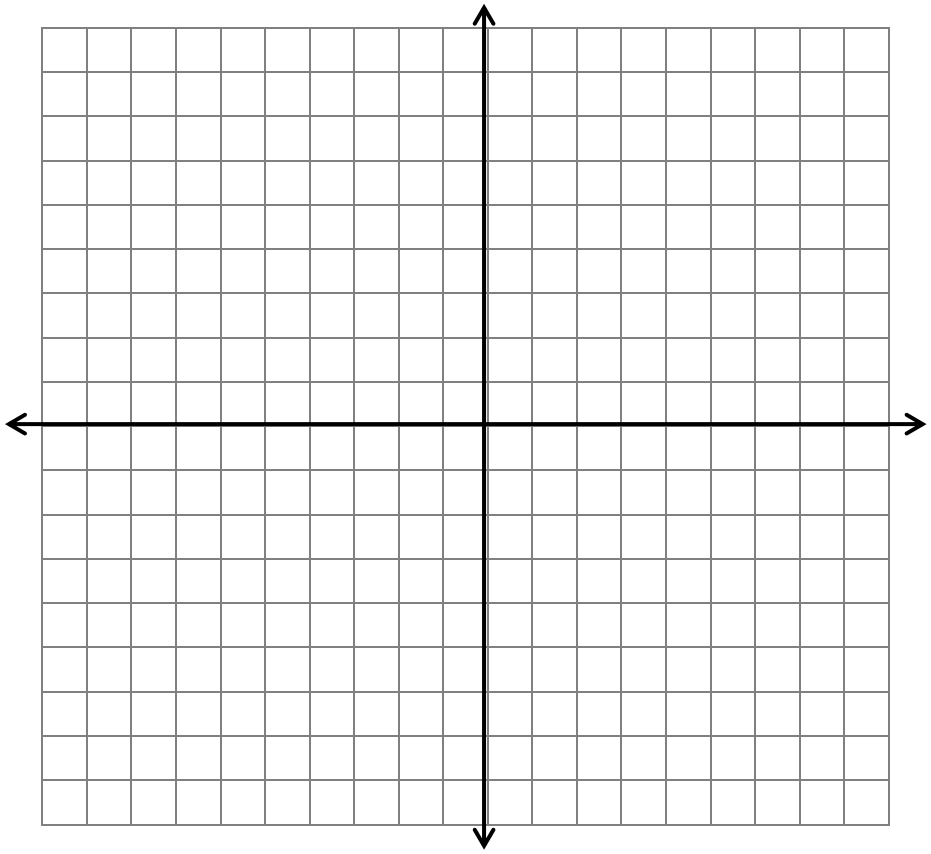
1. Graph:

M(-3, 9) A(-5, 5)
T(-3, 1) H(-1, 5)

and

M”(0, -6) A”(2, -2)
T”(0, 2) H”(-2, -2)

Determine the sequence of the transformations performed to MATH to get M’A’T’H’.



Would it matter which transformation was done first?

Are the shapes congruent or similar?

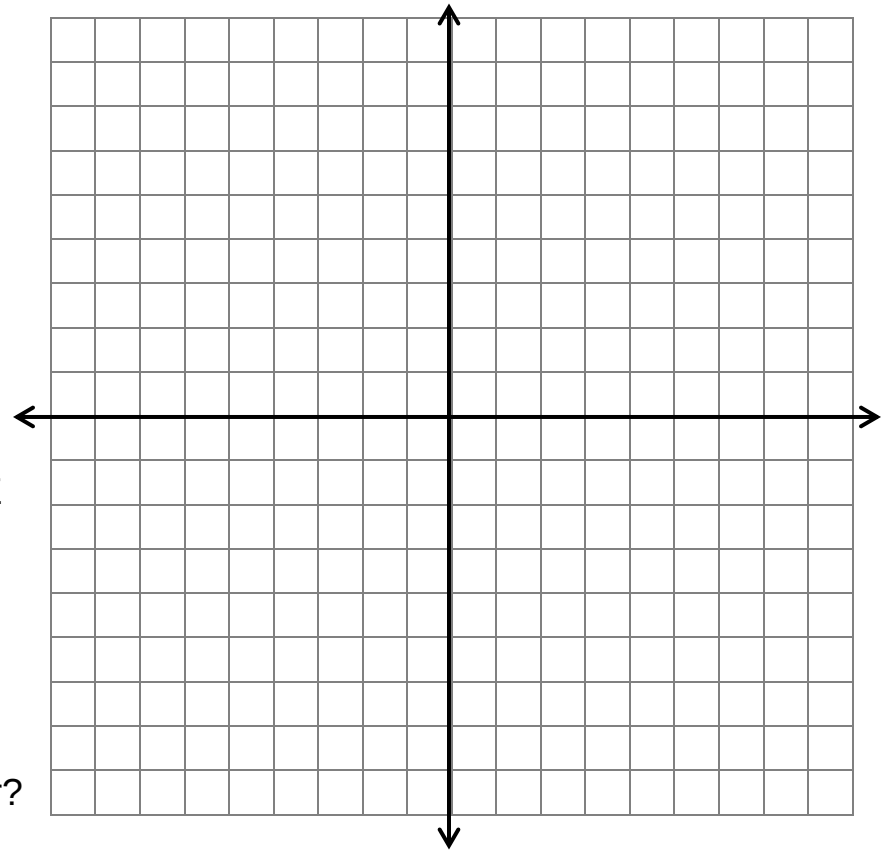
2. Graph:

L(-4, -8) O(-6, -1)
V(-4, -3) E(-2, -1)

and

L”(8, 4) O”(1, 6)
V”(3, 4) E”(1, 2)

Determine the sequence of the transformations performed to LOVE to get L’’O’’V’’E’’.



Are the shapes congruent or similar?

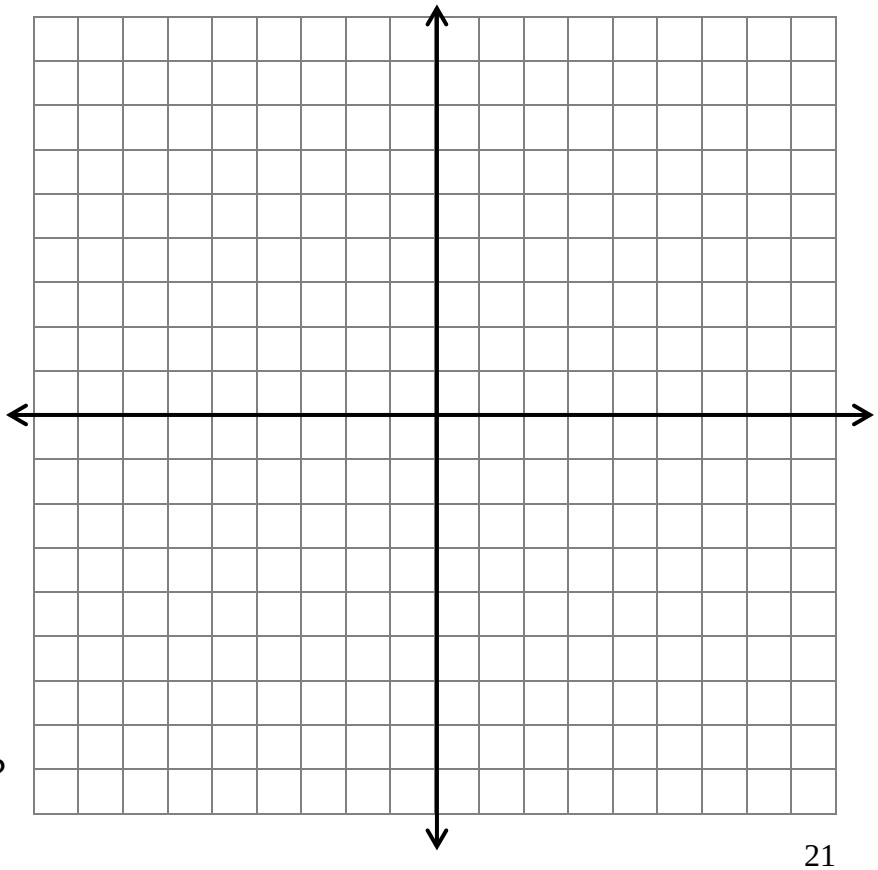
3. Graph

T(-4, 0) R(-8, -6) I(0, -6)

and

T’”(0, 2) R’” (3, 4) I’”(3, 0)

Determine the sequence of the transformations performed to TRI to get T’”R”’I’”.



Are the shapes congruent or similar?

HW #72 Sequencing Transformation

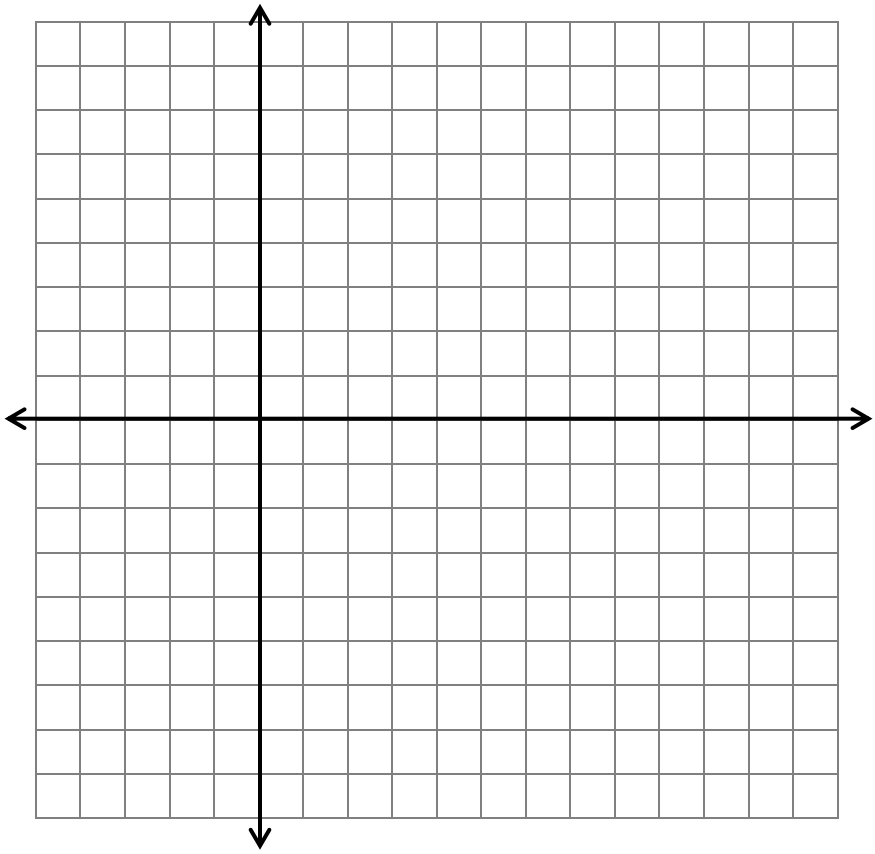
Graph

T(2, 2) R(3, 3) I(4, 2)

and

T”’(6, 0) R”’(9, -3) I”’(12, 0)

Determine the sequence of Transformations performed to TRI to get T”’R”’I”’.



Lesson #73 Sequencing Transformations Continued

Congruence Statement Example: Shape TRI can be reflected over the x axis and translated in the direction of (x + 5, y - 4) to get T”R”I” therefore the shapes are congruent.

Statement of Similarity Example: Share TRI can be reflected over the x axis and translated in the direction of (x + 5, y - 4) and dilated by a scale factor of 2 to get T”’R”’I’” therefore the shapes are similar.

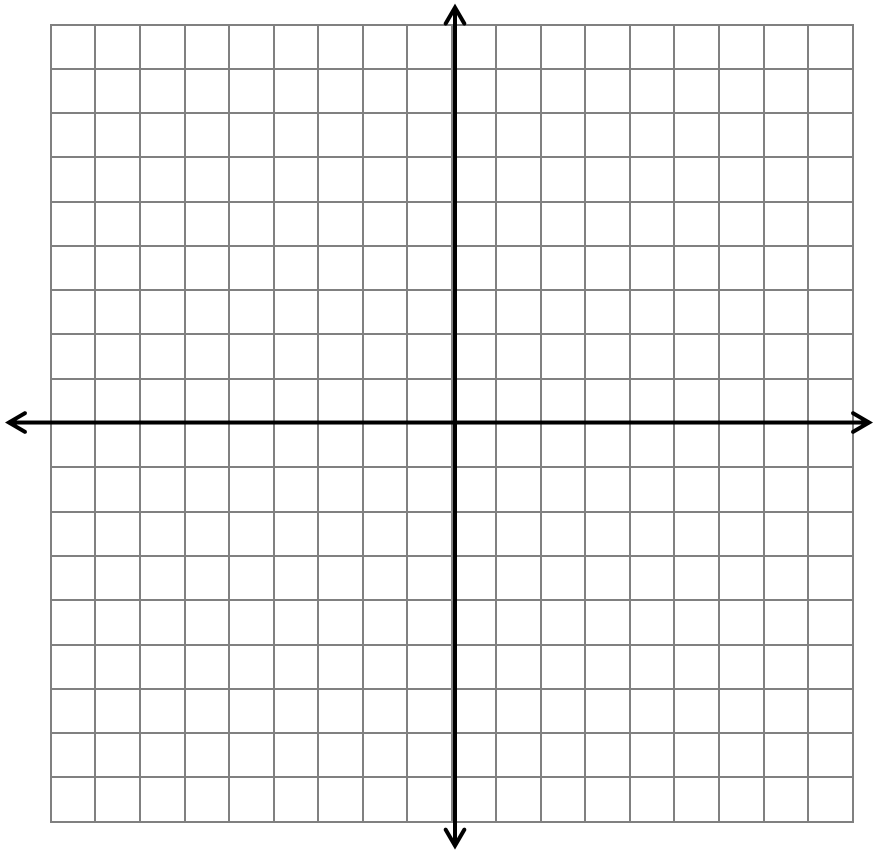
Write a congruence statement or a statement of similarity for each of the following problems.

1. Graph:

M(2, 7) A(5, 7)
T(0, 1) H(7, 1)

and

M”(-2, 3) A”(-5, 3)
T”(0, 9) H”(-7, 9)

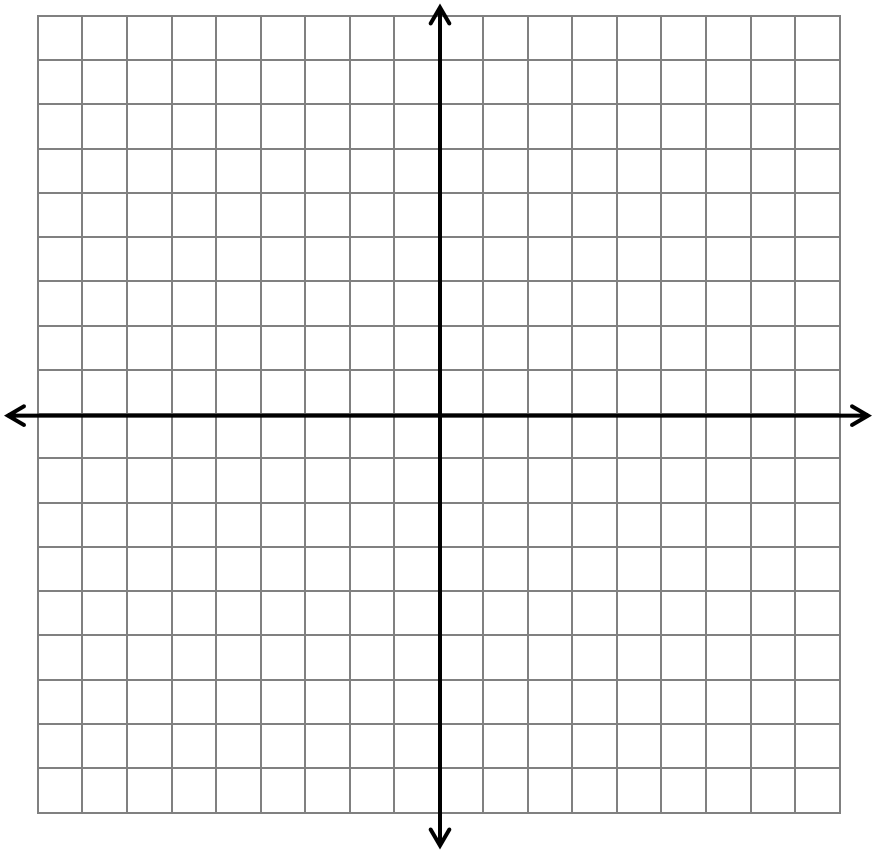


2. Graph:

R(-2, 8) U(-2, 6)
L(-6, 2) E(-8, 2)

and

R”’(4, -1) U”’(3, -1)
L”’(1, -3) E”’(1, -4)

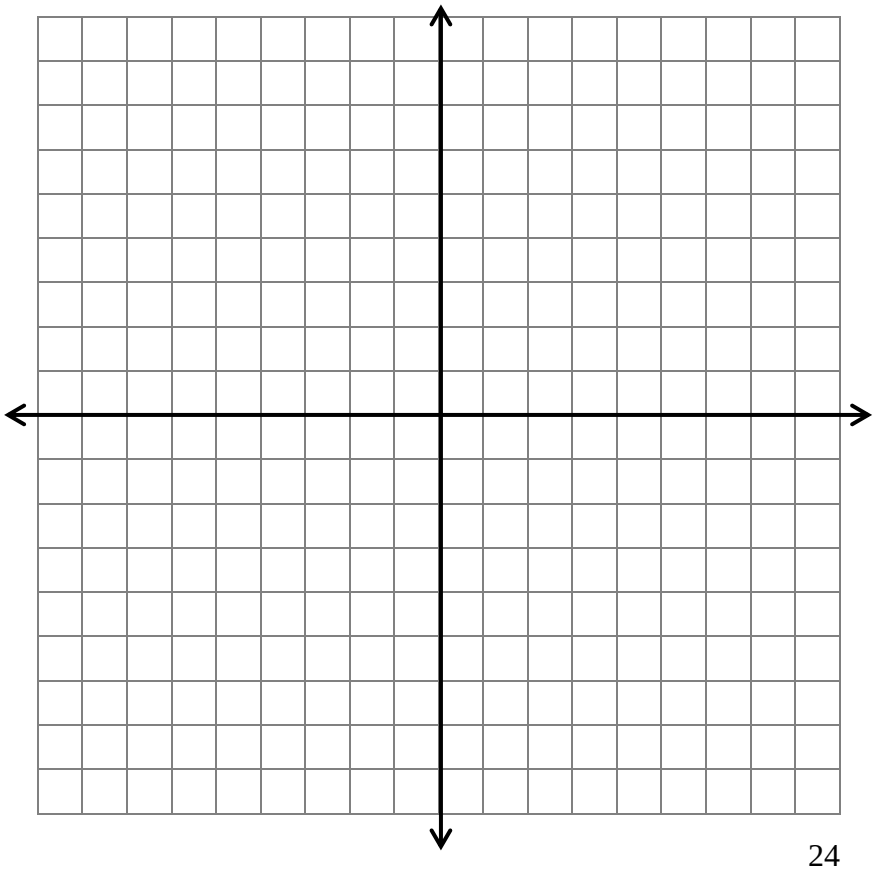


3. Graph

T(-6, -3) R(-6, -9) I(-3, -9)

and

T””(1, 1) R””(1, 3) I””(2, 3)



HW #73 Sequencing Transformations Continued

Graph

T(-8, 2) R(-6, 6) A(-4, 6) P(-2, 2)

and

T’’’(1, -4) R’’’(3, -3)
A’’’(3, -2) P’’’(1, -1)

Determine the sequence of transformations performed to TRAP to get T’’’R’’’A’’’P’’’.